

19991015.ba v02_n701.bam.991015 v02_n702.bam.991015

>From ???@??? Fri Oct 15 16:58:31 1999
Message-Id: <199910150615.d9F6Fm112325@sco.theporch.com>
Date: Fri, 15 Oct 1999 01:14:42 CDT
From: Old Tube Radios <boatanchors@theporch.com>
To: Old Tube Radios <boatanchors@theporch.com>
Subject: BOATANCHORS digest 2701

BOATANCHORS Digest 2701

Topics covered in this issue include:

- 1) re: crystals question
by Bob Roehrig <broehrig@admin.aurora.edu>
- 2) Hammond museum
by William Donzelli <aw288@osfn.org>
- 3) Wtd: Manuals Federal 101, Mackay 401A
by Hue Miller <kargokult@proaxis.com>
- 4) Re: Hammond museum
by BobR <brainbol@sunflower.com>
- 5) Hammarlund TCR
by "Robert Nickels" <ranickel@mwci.net>
- 6) "QST" prices??
by "Sandy Blaize" <ebjr@i-55.com>
- 7) Re: 70's Something
by Jderm740@aol.com
- 8) Re: Help with SP600-JX-14
by Al Parker <anchor@coastalnet.com>
- 9) Re: MORE NAILS IN THE RECEIVER
by jim lockwood <jmlckwd@mindspring.com>
- 10) RE: YE Antenna Question
by "ROBERT W. DOWNS" <RWDowns_WA5CAB@compuserve.com>
- 11) SWAP Drake TR4Cw for Drake TR7A
by "Bob Duckworth" <wb4mnf@atl.org>
- 12) Need TV-3B schematic or manual
by Phil Mills <plmills@attglobal.net>
- 13) Need Manual for Viking II and 122 VF0
by George T Folse III <kb5ww@bellsouth.net>
- 14) YE Antenna Question
by Andre Guibert <aguibert@sympatico.ca>
- 15) 3CX3000F7 tube offer/info
by sbrovas <sbrovas@tir.com>
- 16) HT-33B WANTED
by Sandy Gerli <angerli@esslink.com>
- 17) Re: Leece-Neville
by Jderm740@aol.com
- 18) FS: Heathkit IB-2A Impedance Bridge

- by Dave <davidh@getnet.com>
- 19) Re: YE Antenna Question
by Hue Miller <kargokult@proaxis.com>
- 20) Re: YE Antenna Question
by "Roberta J. Barmore" <rbarmore@indy.net>
- 21) Re: YE Antenna Question
by Hue Miller <kargokult@proaxis.com>
- 22) Re: YE Antenna Question
by "Barry L. Ornitz" <ornitz@tricon.net>
- 23) Wanted: Misc!
by William Donzelli <aw288@osfn.org>
- 24) Coil winder
by Morris Odell <morriso@vifp.monash.edu.au>
- 25) BA Computers...
by "Scott Alfter" <salfter@delphi.com>
- 26) Plate Chokes
by Arden Allen <gumbear@pacbell.net>

Date: Wed, 13 Oct 1999 22:20:42 -0500 (CDT)
From: Bob Roehrig <broehrig@admin.aurora.edu>
To: Old Tube Radios <boatanchors@theporch.com>
cc: Old Tube Radios <boatanchors@theporch.com>
Subject: re: crystals question
Message-ID: <Pine.OSF.3.96.991013222012.6893A-1000000@admin.aurora.edu>
MIME-Version: 1.0
Content-Type: TEXT/PLAIN; charset=US-ASCII

On Wed, 13 Oct 1999, Hue Miller wrote:

> But my question is, are the 21 MHz range crystals likely to be fundamentals,
> or overtone? I say a couple that were on the 15 meter band.

Usually, xtals over 20 MHz are overtone.

"Nostalgia is a thing of the past"
E-mail: broehrig@admin.aurora.edu or k9eui@arrl.net 73 de Bob, K9EUI
CIS: Data / Telecom Aurora University, Aurora, IL
630-844-4898 Fax 630-844-4222

Date: Wed, 13 Oct 1999 23:29:27 -0400 (EDT)
From: William Donzelli <aw288@osfn.org>
To: Old Tube Radios <boatanchors@theporch.com>
Subject: Hammond museum
Message-ID: <Pine.SUN.3.91-FP.991013232648.12583E-1000000@osfn.org>
MIME-Version: 1.0
Content-Type: TEXT/PLAIN; charset=US-ASCII

Is the Hammond Museum in Ontario open by appointment only? I may be in the area sometime in the next few weeks, and think it could be a neat diversion.

William Donzelli
aw288@osfn.org

Message-Id: <3.0.5.32.19991013204113.007c3430@proaxis.com>
Date: Wed, 13 Oct 1999 20:41:13 -0700
To: Old Tube Radios <boatanchors@theporch.com>
From: Hue Miller <kargokult@proaxis.com>
Subject: Wtd: Manuals Federal 101, Mackay 401A
Mime-Version: 1.0
Content-Type: text/plain; charset="us-ascii"

well, this is what's known as a moon shot. But before i steel myself to drawing out the schematics myself, i thot i would ask:

Federal 101 Field strength meter for AM broadcast, probably 1940s, has loop antenna in case front lid, battery powered instrument.

Mackay 401A lifeboat radio

manual or schematic (or anything) wanted -
tnx, Hue Miller

Message-ID: <3805571B.44D7@sunflower.com>
Date: Wed, 13 Oct 1999 23:07:55 -0500
From: BobR <brainbol@sunflower.com>
MIME-Version: 1.0
To: Old Tube Radios <boatanchors@theporch.com>
Subject: Re: Hammond museum
Content-Type: text/plain; charset=us-ascii
Content-Transfer-Encoding: 7bit

According to their home page:

<http://www.kwarc.on.ca/hammond/announce.html>

you need an appointment. They say call 519-822-2960, ext. 252, to arrange for a visit.

Bob/WB0AUQ

William Donzelli wrote:

>
> Is the Hammond Museum in Ontario open by appointment only? I may be in
> the area sometime in the next few weeks, and think it could be a neat
> diversion.
>
> William Donzelli
> aw288@osfn.org

Message-ID: <02ac01bf15fa\$da6199e0\$c10ccfd1@default>
From: "Robert Nickels" <ranickel@mwci.net>
To: Old Tube Radios <boatanchors@theporch.com>
Subject: Hammarlund TCR
Date: Wed, 13 Oct 1999 23:14:29 -0500
MIME-Version: 1.0
Content-Type: text/plain;
 charset="iso-8859-1"
Content-Transfer-Encoding: 7bit

While browsing the Nov. 64 issue of QST, I ran across something interesting - a Hammarlund ad featuring the TCR "Transmitter Controlled Receiver". Evidently this little gizmo would make the HQ-170 or HQ-180 receivers transceive using the HX-50 VF0. The module fit into the space in the front panel of the receiver where the clock otherwise fits.

Has anyone ever seen - or owned - a TCR setup?

73, Bob W9RAN

Message-ID: <000301bf15d5\$1607f1e0\$3864e7d0@sandy-s-pentium>
From: "Sandy Blaize" <ebj@i-55.com>
To: Old Tube Radios <boatanchors@theporch.com>
Subject: "QST" prices??
Date: Wed, 13 Oct 1999 23:44:15 -0000
MIME-Version: 1.0
Content-Type: text/plain;
 charset="iso-8859-1"
Content-Transfer-Encoding: 7bit

Hello All,

I need to know what QST going prices are now. Years from around 1960-1990.

I have acquired a collection and want to sell or trade off the dupes. Please private e-mail me about this. Thanks.

73,

Sandy W5TVW

From: Jderm740@aol.com
Message-ID: <0.63f76956.25373714@aol.com>
Date: Thu, 14 Oct 1999 09:39:32 EDT
Subject: Re: 70's Something
To: Old Tube Radios <boatanchors@theporch.com>
MIME-Version: 1.0
Content-Type: text/plain; charset="us-ascii"
Content-Transfer-Encoding: 7bit

Hello one and all

I have to ask a question. When did I miss the beginning of this simis? I download and record to floppie every digest. Now I travel now and then and I might have been on Mongo visiting a client at the time it began and missed the first missile, so can someone fill me in?

Also, it seems someone has been useing a "Dan Quale" Spellchecker. And that has given somebody else heartburn. I use a pocket spellchecker. Used by secretaries for years. Fits nicely in my purse (when I'm haveing one of my transference moments).

Jack McDermott Jderm740@aol.com

Message-Id: <3.0.6.32.19991014105640.00885100@mail2.coastalnet.com>
Date: Thu, 14 Oct 1999 10:56:40 -0700
To: Old Tube Radios <boatanchors@theporch.com>
From: Al Parker <anchor@coastalnet.com>
Subject: Re: Help with SP600-JX-14
Mime-Version: 1.0
Content-Type: text/plain; charset="us-ascii"

HI George et al,

 If your rcvr had black beauties, and has been recapped, or if it's got the (rare) disks, follow Arden's advice.

 If it's still got BBOD's, bite the bullet, replace them all. They'll continue to go bad one by one (or several at a time), causing lots of this kind of aggravation - you'll spend more time chasing than the 20 hrs or so to re-cap.

FWIW,
73,

Al, W8UT
New Bern, NC
BoatAnchors appreciated here

anchor@coastalnet.com

Message-Id: <3.0.32.19991014055404.006fc99c@pop.mindspring.com>

Date: Thu, 14 Oct 1999 09:52:45 -0700

To: Old Tube Radios <boatanchors@theporch.com>

From: jim lockwood <jmlckwd@mindspring.com>

Subject: Re: MORE NAILS IN THE RECEIVER

Cc: boatanchors@theporch.com

Mime-Version: 1.0

Content-Type: text/plain; charset="us-ascii"

Hi John,

At 06:24 PM 10/12/1999 -0400, you wrote:

>To: boatanchors@theporch.com

>

>My Halli SX-100 arrived with a short piece of #12 copperweld (copper plated
>steel) wire soldered between adjacent sections of the main tuning cap in an
>attempt to give it some much-needed fore & aft mech. stability. Can't
>vouch for fix as I haven't removed it to compare.

One of my SX-100s has a stiff piece of wire soldered to the T-notch filter
subchassis and to the partition that separates sections of the tuning caps.

It also has two stiff wires soldered to the main tuning cap rear end
frame, the partition, and the front end frame. In addition to all of
this, there is a screw securely wedged between the two front mounting
plates of the main tuning cap.

And after all of this, I would have to say this SX-100 has the greatest
mechanical stability of the three I have.

73,

Jim - K4CCF

(formerly KM6NK, WA4K00, WN4K00)

Looking for original QSL cards from K4CCF

<http://www.mindspring.com/~johnmb/radiorm1.htm>

Date: Thu, 14 Oct 1999 15:29:53 -0400

From: "ROBERT W. DOWNS" <RWDowns_WA5CAB@compuserve.com>

Subject: RE: YE Antenna Question

To: Old Tube Radios <boatanchors@theporch.com>

Message-ID: <199910141530_MC2-8906-8FF0@compuserve.com>

MIME-Version: 1.0
Content-Transfer-Encoding: quoted-printable
Content-Type: text/plain;
charset=ISO-8859-1
Content-Disposition: inline

Hue & Group,

That's correct in the idealized case, but remember that the transmitter beam was relatively broad, and even if it weren't, the only clue to what angle you were crossing from one section to the other at would be how long you could hear both letters. So your best guess of the heading to the ship would have an uncertainty of >150 degrees or so anyway. Unless your magnetic compass wasn't working, "all" that you had to do was fly the reciprocal bearing for the days letter, which gives you an uncertainty of=

+/-15 degrees. Also, the aircraft to ship ratio, with the aircraft presumed to be at Most Economical Cruise, and the ship in a hurry would only be on the order of 5:1, maybe even less for the SBD's or TBM's.

WRT over the horizon, how 'bout if I change that to "well beyond visual range"?

Message text written by Hue Miller

>-i'm still thinking even if this true bearing sytem failed, once you crossed from one beam to another, you have enough basic information to give you a=

start in the right direction, then you can refine it from there. Because the letters have some set sequence, there's no 180 degree ambiguity. The ship's not moving that fast, compared to the aircraft, and even without compass reference, you still have, basically, a radio homing beacon, no? Also - over the horizon=

?
At 250 Mc/s, probably not very far over the horizon, or?
<

Robert Downs
WA5CAB
Houston

Message-Id: <199910142006.QAA01327@hat-trick.atl.org>
From: "Bob Duckworth" <wb4mnf@atl.org>
To: Old Tube Radios <boatanchors@theporch.com>
Subject: SWAP Drake TR4Cw for Drake TR7A
Date: Thu, 14 Oct 1999 15:59:48 +0100

Have:

Drake TR4Cw (not RIT) new finals, new driver, power supply, MS-4
recent alignment (actually on the bench now and about half way through :-),
nice looking, ratty manual, does not have 'blue' dial, just the plain old
original white. Will put photos up at
<http://www.debris.org/radio/swaps/drake>
but proably not until the weekend.

Swap for:

Drake TR7(A), power supply, PS-7. Plain old TR7 must have filters
of the 'A'

-or-

Signal One CX7, A, or B or later model Signal One (will take inop
on later model or kick in some bux if it's working)

-or-

apply as partial swap towards National NTX-30 if anyone has and
wants a TR4Cw badly.

-or-

SW-5

-or-

other pre-WW2 stuff I haven't had before

-or-

?????

-bob

Message-ID: <380643E5.2B067DD2@attglobal.net>
Date: Thu, 14 Oct 1999 15:58:13 -0500
From: Phil Mills <plmills@attglobal.net>
MIME-Version: 1.0
To: Old Tube Radios <boatanchors@theporch.com>
Subject: Need TV-3B schematic or manual
Content-Type: text/plain; charset=us-ascii
Content-Transfer-Encoding: 7bit

Hello,

I have a sick TV-3B military tube tester that I need to repair. I'm in need of a manual or schematic copy. If you can help, please e-mail me.

thanks,
Phil
AB5TH

Message-ID: <3806505A.31F1@bellsouth.net>
Date: Thu, 14 Oct 1999 16:51:22 -0500
From: George T Folse III <kb5wwwo@bellsouth.net>
MIME-Version: 1.0
To: Old Tube Radios <boatanchors@theporch.com>
CC: boatanchors@theporch.com
Subject: Need Manual for Viking II and 122 VFO
Content-Type: text/plain; charset=us-ascii
Content-Transfer-Encoding: 7bit

All,

I need a copy of the manuals for the Viking II and the 122 VFO. Will pay the cost of the copies and postage.

Thanks,
George

Date: Thu, 14 Oct 1999 19:53:44 -0400 (EDT)
Message-Id: <1.5.4.16.19991014194700.1e37994a@pop1.sympatico.ca>
Mime-Version: 1.0
Content-Type: text/plain; charset="us-ascii"
To: Old Tube Radios <boatanchors@theporch.com>
From: Andre Guibert <aguibert@sympatico.ca>
Subject: YE Antenna Question

Bonsoir to All

When confused I go back to square one.

The carrier(s) would transmit a continuous signal for the pidgeons to home in?

The ennemy is listening and DFing and not care for the codes.

Must be a short range rough homing system to a particular carrier, not fleet, in the proper landing quadrant.

God bless the pidgeons if the carrier is sunk, would have to change to ducks.

Do I have to go back to another square one?

Andre

Andre Guibert
aguibert@sympatico.ca

Message-ID: <38069C31.666214BE@tir.com>
Date: Thu, 14 Oct 1999 20:14:57 -0700
From: sbrovas <sbrovas@tir.com>
MIME-Version: 1.0
To: Old Tube Radios <boatanchors@theporch.com>
Subject: 3CX3000F7 tube offer/info
Content-Type: text/plain; charset=us-ascii
Content-Transfer-Encoding: 7bit

Hi All,

A friend has a few Eimac 3cx3000F7 tubes available from an estate.
Any interest in these. They are still in packing and some do have a
little corrosion on the fins. Any idea of the price range?

All info will be passed to him and responses made by email.

Tnx for the help.

73's de Bill, WA1APX/8

Message-ID: <380683E4.516B77C8@esslink.com>
Date: Thu, 14 Oct 1999 21:31:16 -0400
From: Sandy Gerli <angerli@esslink.com>
MIME-Version: 1.0
To: Old Tube Radios <boatanchors@theporch.com>
Subject: HT-33B WANTED
Content-Type: text/plain; charset=us-ascii
Content-Transfer-Encoding: 7bit

Hi,

Looking for an HT-33B w/manual in good condx.

73,

--
Sandy Gerli, AC1Y

500 Country Club Road
Avon, CT 06001-2406
(860) 675-5566
E-Mail: angerli@esslink.com

Life Member: ARRL, QCWA
Collins Collectors Association
Hallicrafters Collectors Association

Boatanchors are Ham Radio's living heritage!
Restore something! Smell that hot solder!
Better 'n booze. And, you can get up afterwards!!
Keep your finals dipped, now...

From: Jderm740@aol.com
Message-ID: <0.753cf60f.2537df28@aol.com>
Date: Thu, 14 Oct 1999 21:36:40 EDT
Subject: Re: Leece-Neville
To: Old Tube Radios <boatanchors@theporch.com>
MIME-Version: 1.0
Content-Type: text/plain; charset="us-ascii"
Content-Transfer-Encoding: 7bit

Hue

Back in the good old days of 6 volt systems, 30s,40s and 50s police cars were converted from stock generator systems to L-N alternators to get the power to drive those big honking radio units that filled the trunks of Fords and Chevys. They were connected to big selenium rectifiers to provide DC for all the equipment. But, they still needed a regulated 6 volts for the rest of the car and battery. I think you have one of the transformers that provided the 6 volts for the car. I have no idea what kind of power they sent to the trunk for the Transcievers. I was a kid working in a garage in those days and had seen these things but never worked on them. I don't think the PD mechanic ever worked on them either. I think L-N took care of them on a contract basis. I just know you never keyed the trans without stepping on the gas to raise the RPMs. Or the darn thing would stall. Especially the Chevys.

Jack McDermott Jderm740@aol.com

Message-ID: <38068A4B.4F5C0E50@getnet.com>
Date: Fri, 15 Oct 1999 01:58:46 +0000
From: Dave <davidh@getnet.com>
MIME-Version: 1.0
To: Old Tube Radios <boatanchors@theporch.com>
Subject: FS: Heathkit IB-2A Impedance Bridge

Content-Type: text/plain; charset=us-ascii; x-mac-type="54455854"; x-mac-creator="4D4F5353"

Content-Transfer-Encoding: 7bit

For Sale:

a Heathkit IB-2A Impedance Bridge. The unit works and is in excellent shape. It does not have a manual however they are available from w7fg.com. \$75 plus shipping

Payment by cashier's check or money order. Pictures can be e-mailed upon request.

Thanks,

Dave N7RK

--

Dave N7RK - Webmaster CADXA

Phoenix, Arizona

DXCC Honor Roll

WAZ#23 - 75 Meter SSB

ex-N7RK/ZB2, VK2ERK, ZM0AJN, WB6NRK, WN6IWX

Boatanchor Collector Extraordinaire preferring Hallicrafters, National and what ever else looks interesting!

E-Mail: davidh@getnet.com

My Home Page: <http://www.getnet.com/~davidh>

Visit the Central Arizona DX Association Home page - <http://cadxa.org>

Message-Id: <3.0.5.32.19991014191114.007f6b70@proaxis.com>

Date: Thu, 14 Oct 1999 19:11:14 -0700

To: Old Tube Radios <boatanchors@theporch.com>

From: Hue Miller <kargokult@proaxis.com>

Subject: Re: YE Antenna Question

Mime-Version: 1.0

Content-Type: text/plain; charset="us-ascii"

At 07:53 PM 10/14/99 -0400, Andre Guibert wrote:

> When confused I go back to square one.

> The carrier(s) would transmit a continuous signal for the
> pigeons to home in? The enemy is listening and DFing and
not care for the codes.

--that's the beauty of this system: the enemy wasn't (most probably)
listening.

Japan didn't have nearly the VHF technique the Allies did, and IF a
Japanese ship did happen to have a search receiver tuning this high,
250 MHz, it wouldn't be likely to be able to demodulate a 1-MHz carrier
from that.

Must be a short range rough homing system to a particular
> carrier, not fleet, in the proper landing quadrant.

>
> God bless the pigeons if the carrier is sunk, would have
> to change to ducks.

--you hope there's another carrier in the group.

Hue Miller

Date: Thu, 14 Oct 1999 21:28:01 -0500 (EST)
From: "Roberta J. Barmore" <rbarmore@indy.net>
To: Old Tube Radios <boatanchors@theporch.com>
cc: Old Tube Radios <boatanchors@theporch.com>
Subject: Re: YE Antenna Question
Message-ID: <Pine.SUN.4.10.9910142119190.29679-100000@indy3>
MIME-Version: 1.0
Content-Type: TEXT/PLAIN; charset=US-ASCII

Hi!

And hey, now, *wait:*

We have a 250 Mc/s transmitter with 1 Mc/s amplitude modulation, and we
wanna tune it in. That means you're gonna be generating sidebands at +/-
1 Mc/s; so what's to keep us from tuning our rushbox receiver to
249 or 251 MHz (+/- a little AF) and hearing it? Just a coupla' carriers
as far as the receiver cares.

Otta be able to demodulate *something.* Mighta sounded like mush but if
all you're doing is DFing, what do you care?

So the "outsmart Tojo's techs" approach only works *if* they haven't
got any UHF receivers worth a darn. Which is possible--they had the smarts
(When and where do you think Dr. Yagi worked?) but may not have had the
gear.

73,
--Bobbi

KB9GKX "RJ" rbarmore@indy.net Roberta J. (Bobbi) Barmore
FISTS #3388 * G-QRP #10001 * ARRL * RSGB * WIA
Appreciator Of Vacuum-Tube Ham Gear and Vintage Keys

Message-Id: <3.0.5.32.19991014200952.007be100@proaxis.com>
Date: Thu, 14 Oct 1999 20:09:52 -0700
To: Old Tube Radios <boatanchors@theporch.com>
From: Hue Miller <kargokult@proaxis.com>
Subject: Re: YE Antenna Question
Mime-Version: 1.0
Content-Type: text/plain; charset="us-ascii"

At 09:28 PM 10/14/99 -0500, Roberta J. Barmore wrote:

> And hey, now, *wait:*

> We have a 250 Mc/s transmitter with 1 Mc/s amplitude modulation, and we
> wanna tune it in. That means you're gonna be generating sidebands at +/-
> 1 Mc/s; so what's to keep us from tuning our rushbox receiver to
> 249 or 251 MHz (+/- a little AF) and hearing it? Just a coupla' carriers
> as far as the receiver cares.

> Otta be able to demodulate *something.* Mighta sounded like mush but if
> all you're doing is DFing, what do you care?

--well, from whatever articles and lists of Japanese VHF gear i have
encountered, there wasn't much of this equipment. This wasn't a real
long range system, so shipboard or aircraft plain old radar probably
would have done the same enemy-locating job as having special search
receivers. Their search receiver would probably have to be a superhet
also, i'm thinking the touted "self AGC" action of the superregren
might limit it's DF effectiveness.

(An aside on search receivers: I once owned an APR-4, the one with
all the tuning units, but i gave it away after i saw how minimum the
higher frequency tuning units were. Sensitivity had to be pretty bad-
but good enough to do the job- maybe just locate a "target" to jam.
I also have a German search receiver that tunes to 500 MHz - but its
action is uniformly poor over the whole range, even down at 100 MHz -
the antenna goes right into a diode mixer. Japanese technology lagged
both these, so i'm sure any of their search receivers would be even
worse.)

> So the "outsmart Tojo's techs" approach only works *if* they haven't
> got any UHF receivers worth a darn. Which is possible--they had the smarts
> (When and where do you think Dr. Yagi worked?) but may not have had the
> gear.

--well, part of smarts is organization, and they did sorta lack that. Too many different radios, rather than fewer standardized models that worked better. Non cooperation between armed services, and slavery to ideology over rationality.....

Hue Miller

Message-Id: <199910150244.WAA26353@flash.naxs.net>
From: "Barry L. Ornitz" <ornitz@tricon.net>
To: Old Tube Radios <boatanchors@theporch.com>
Cc: "Roberta J. Barmore" <rbarmore@indy.net>
Subject: Re: YE Antenna Question
Date: Thu, 14 Oct 1999 23:39:17 -0400

At 09:28 PM 10/14/99 -0500, Roberta J. Barmore wrote:
+AD4- We have a 250 Mc/s transmitter with 1 Mc/s amplitude
+AD4-modulation, and we wanna tune it in. That means you're gonna
+AD4-be generating sidebands at +/- 1 Mc/s+ADs- so what's to keep us from
+AD4-tuning our rushbox receiver to 249 or 251 MHz (+/- a little AF)
+AD4-and hearing it? Just a coupla' carriers as far as the receiver
+AD4-cares.

The selectivity of a simple rushbox (super-regenerative receiver) is as broad as the proverbial barn door. If you keep the modulation level of the modulated 1 MHz signal low, the typical rushbox would likely never know the weaker sidebands were there. You would have to go with superheterodyne reception to get a lower frequency where selectivity could be obtained.

I am also not sure what a typical rushbox would do with a signal modulated well above its quench frequency. For sensitivity, the quench frequency should be as low as possible (but at least twice the highest modulating frequency). I wonder if a self-quenched super-regenerative detector of conventional design would even receive much of this signal at all?

73, Barry L. Ornitz WA4VZQ ornitz+AEA-tricon.net

Date: Fri, 15 Oct 1999 00:31:31 -0400 (EDT)
From: William Donzelli <aw288@osfn.org>
To: Old Tube Radios <boatanchors@theporch.com>
Subject: Wanted: Misc!
Message-ID: <Pine.SUN.3.91-FP.991014173315.1693A-100000@osfn.org>
MIME-Version: 1.0
Content-Type: TEXT/PLAIN; charset=US-ASCII

I am trying to complete some of the BA type IFF (radar) sets around here, and I need a lot of parts and things. Here are some:

- 1) Mount(s) for BC-645-A (SCR-515-A) or CG-43AAG (ABA-1). I think this is a flat plate with four corner posts - but I have never seen one. They were not packed with the see-em-at-every-hamfest black transponder boxes.
- 2) Side handle for I-86-A signal generator. I just need one, maybe off a junker.
- 3) Junker RT-24/APX-2. Mine is missing a small assembly.

Anyone have these evil radar things taking up shelf space?

William Donzelli
aw288@osfn.org

Message-ID: <3806B177.FEE5BD6E@vifp.monash.edu.au>
Date: Fri, 15 Oct 1999 14:45:43 +1000
From: Morris Odell <morriso@vifp.monash.edu.au>
MIME-Version: 1.0
To: Old Tube Radios <boatanchors@theporch.com>
Subject: Coil winder
Content-Type: text/plain; charset=us-ascii
Content-Transfer-Encoding: 7bit

Hi all,

Somebody (? Barry Ornitz) on this list once mentioned trying to homebrew a coil winding machine. I'd appreciate hearing from whoever that was.

73 de Morris VK3DOC

From: "Scott Alfter" <salfter@delphi.com>
To: Old Tube Radios <boatanchors@theporch.com>
Subject: BA Computers...
Date: Thu, 14 Oct 1999 22:34:31 -0700
Message-ID: <NDBBLNEGILHPFKGDMIMBEEACCAAA.salfter@delphi.com>
MIME-Version: 1.0
Content-Type: text/plain;
 charset="iso-8859-1"
Content-Transfer-Encoding: 7bit

A message on Slashdot (<http://slashdot.org>) had this link:

<http://www.inf.fu-berlin.de/~widiger/ICHC/papers/Sale.html>

It's about Colossus, a computer built by the Brits during WWII to crack Germany's Lorenz cipher machines. It goes into the work at Bletchley Park that enabled the design and construction of Colossus (there were eventually 10 of them in operation) and also discusses some of the circuits (hollow-state, of course) used. One interesting quote is that "Colossus is so fast and parallel that a modern Pentium PC programmed to do the same code breaking task takes twice as long as Colossus to achieve a result!" Not bad for 50+-year-old technology. :-)

Scott Alfter
salfter@delphi.com

Date: Thu, 14 Oct 1999 23:13:25 -0700
From: Arden Allen <gumbear@pacbell.net>
Subject: Plate Chokes
To: Old Tube Radios <boatanchors@theporch.com>
Message-id: <0FJM004G9RYZUL@mta3.snfc21.pbi.net>
MIME-version: 1.0
Content-type: text/plain; charset=ISO-8859-1
Content-transfer-encoding: 7bit

RF Chokers;

Stumbling around on the Internet I came across the RF Amplifiers Mailing List for our QRO contesting brethren at <<http://www.contesting.com/>>. I recovered from their archives (by chance) the following which helps to shed some light on the subject of plate chokes:

>What is the usual method of measuring the series resonance of a plate
>choke?

Well, what I have seen done and suggested is to short the ends of the choke together and measure the resonance with a dip meter. This is how I measure mine.

>
>Probably a silly question, but could there be more than one series
resonant
>frequency?

Yes, there is actually. The graph of a choke's impedance versus frequency actually looks similar to what the graph of a bouncing ball would look like. It starts out low (as the ball is thrown upward from

floor level), peaks, comes back down, hits the floor, bounces up again, reaches a second but smaller peak, comes back down again, etc. Each succeeding peak is smaller and smaller until everything's all damped out.

The impedance of a choke looks this way as well. For a given inductance at some particular "low" frequency, the choke looks like a very low impedance. Then as the frequency increases, the impedance rises. However, eventually the parasitic capacitance of the windings, etc, begin to take their toll and the impedance begins to drop off. I believe the peak is what you could call the "parallel resonance point." Finally when the inductive and capacitive reactances are equal (and in an equivalent circuit in "series") we have our series resonance point of minimum impedance. However, as frequency continues to increase, we go beyond the series resonance point and the impedance increases until we hit another parallel resonance point and then as we continue to increase we hit another series resonance, etc....

>From my experience, albeit limited, I have found that the trick is in building a choke that has a large enough inductance so that at the low end of your frequency range you have a large impedance, but yet at the high end, you don't have that first resonance right in or near your desired band of operation. Some people build chokes with a first resonance around 11 or 12 MHz. The second resonance is then typically around 25 MHz or so. Before the WARC bands, you could pick a good spot like that to put your choke resonance. However, if you want to include the warc bands it's not so easy.

Here's the link to the posting I'm quoting from for credit purposes and also for those who are interested in exploring their archives:
<http://www.contesting.com/_amps/9810/0449.html>. I wish I had more time. Have fun.

Arden Allen KB6NAX Vallejo, CA gumbear@pacbell.net

End of BOATANCHORS Digest 2701

>From ???@??? Sat Oct 16 05:16:19 1999
Message-Id: <199910160304.d9G34Mp19260@sco.theporch.com>
Date: Fri, 15 Oct 1999 22:03:51 CDT
From: Old Tube Radios <boatanchors@theporch.com>
To: Old Tube Radios <boatanchors@theporch.com>
Subject: BOATANCHORS digest 2702

BOATANCHORS Digest 2702

Topics covered in this issue include:

- 1) BA computers: Colossus pictures and more info!
by "JOSE V. GAVILA (EB5AGV/EC5AAU)" <eb5agv@ctv.es>
- 2) Trio/Kenwood 9R-59D info?
by "JOSE V. GAVILA (EB5AGV/EC5AAU)" <eb5agv@ctv.es>
- 3) New Vintage Amateur Radio Program on WBCQ
by Michael Crestohl <mc@sover.net>
- 4) Need Halli S-108 manual
by "Steve Hill" <SHILL@onaustralia.com.au>
- 5) Audio transformer needed
by "Lewandowski, Tom" <Tom.Lewandowski@discsystems.com>
- 6) RE: Audio transformer needed
by "Lewandowski, Tom" <Tom.Lewandowski@discsystems.com>
- 7) rack panel data offer.....
by "Tom R. Rice" <tomrice@netcom.com>
- 8) Re: Coil Winder
by "McGregor" <cbmcg@gte.net>
- 9) Xtals wanted
by BEN NOCK <G4BXD@compuserve.com>
- 10) Fw: Mikes
by John jack M Iverson <jackiv@juno.com>
- 11) Re: Need Manual for Viking II and 122 VFO
by George T Folse III <kb5ww@bellsouth.net>
- 12) ZBX Mystery Solved
by "ROBERT W. DOWNS" <RWDowns_WA5CAB@compuserve.com>
- 13) Re: YE Antenna
by Jderm740@aol.com
- 14) Electrical Safety Handbook
by "Arden Allen" <gumbear@pacbell.net>

Message-Id: <3.0.5.32.19991015085117.008102d0@212.25.129.11>
Date: Fri, 15 Oct 1999 08:51:17 +0200
To: Old Tube Radios <boatanchors@theporch.com>
From: "JOSE V. GAVILA (EB5AGV/EC5AAU)" <eb5agv@ctv.es>
Subject: BA computers: Colossus pictures and more info!
Mime-Version: 1.0
Content-Type: text/plain; charset="us-ascii"

Wow!!!

Really interesting stuff. Thanks Scott!. I have looked for more info and have found pictures of the beast, as it was and as it is now. Amazing!

<http://www.cranfield.ac.uk/ccc/bpark/colossus-update.html>

This WEB has been done by the person who is managing the rebuild, Tony Sale.

Hope you enjoy it as I did!

Regards,

JOSE

PS: hope you don't find this as off-topic; in fact, Colossus was made to decipher RADIO messages ;-)

73 EB5AGV / EC5AAU
JOSE V. GAVILA
Benetusser - VALENCIA (SPAIN)

*** VISIT MY VINTAGE RADIO SITE - updated 30-September-1999 ***
<http://www.geocities.com/SiliconValley/6992/>

EuroBA eGroup: http://www.eGroups.com/list/euro_ba_swap

ICQ 43817777

Message-Id: <3.0.5.32.19991015093354.00802430@212.25.129.11>
Date: Fri, 15 Oct 1999 09:33:54 +0200
To: Old Tube Radios <boatanchors@theporch.com>
From: "JOSE V. GAVILA (EB5AGV/EC5AAU)" <eb5agv@ctv.es>
Subject: Trio/Kenwood 9R-59D info?
Mime-Version: 1.0
Content-Type: text/plain; charset="us-ascii"

Hi gang,

As my Christmas 'auto-gift' ;-) (yes, I know we are in October... but as shipping will be by surface mail, from Canada to Spain, it will arrive close to Christmas time) I am going to buy an old Trio/Kenwood 9R-59D tubed receiver. I wonder if you could comment on it (performance, known problems, tube lineup, ...) as I have never seen one. I have looked for a picture in the Net and, amazingly, I have been able to find just a poor picture in a japanese language page (which I don't understand). Any hint to locate a picture?. I would be glad to receive e-mailed pictures, if available...

I would also like to find a manual for it, as the seller says it is 'a bit deaf' and sure will need some care and feeding.

Thanks and best regards,

JOSE

73 EB5AGV / EC5AAU
JOSE V. GAVILA
Benetusser - VALENCIA (SPAIN)

*** VISIT MY VINTAGE RADIO SITE - updated 30-September-1999 ***
<http://www.geocities.com/SiliconValley/6992/>

EuroBA eGroup: http://www.eGroups.com/list/euro_ba_swap

ICQ 43817777

Message-Id: <4.2.0.58.19991014181200.00b776c0@mail.sover.net>
Date: Fri, 15 Oct 1999 03:38:02 -0400
To: Old Tube Radios <boatanchors@theporch.com>
From: Michael Crestohl <mc@sover.net>
Subject: New Vintage Amateur Radio Program on WBCQ
Cc: boatanchors@listserv.tempe.gov
Mime-Version: 1.0
Content-Type: text/plain; charset="us-ascii"; format=flowed

Hey Gang:

Starting this Saturday evening at 7:30 Eastern Daylight Time (2330Z) a new weekly radio show will debut on WBCQ The Planet which broadcasts on 7415 Kilocycles. It will focus on tube-type radio communication equipment discussions, interviews, guests, tapes from the past, ham radio music & folklore, great tunes from the 70s and 80s, the odd commercial and just plain fun. In other words, we're gonna play radio!!!!

The new program is called REAL RADIO. Mr Mike, W1RC and The Timtron, WA1HLR are the show hosts.

This week's program will feature some very important news that is sure to be of great interest to everyone interested in military and government radio equipment. Also featured will be a special surprise guest. Mark your calendar and don't miss it!

We actively encourage input from you the shortwave listener. A special e-mail address has been set up to receive correspondence - RealRadio@usa.net! A .mp3 version of each program will eventually be posted to a suitable Internet Newsgroup or Web site for downloading.

See ya!

73,

MrMike, W1RC
The Timtron, WA1HLR

Message-ID: <000301bf16e7\$a7045a40\$27a8868b@me>
From: "Steve Hill" <SHILL@onaustralia.com.au>
To: Old Tube Radios <boatanchors@theporch.com>
Subject: Need Halli S-108 manual
Date: Fri, 15 Oct 1999 18:30:44 +1000

Gang,

I am need of a manual for a Hallicrafters S-108.

Copy or scanned schematic is fine.

Thanks

Steve Hill VK4CZT
<SHILL@onaustralia.com.au>
visit my military radio page
<<http://www.users.bigpond.com/SHILL>>
Brisbane. Australia.

Message-ID: <9D2010848EBAD2118A9F0004ACB82C8560B86B@DISC04>
From: "Lewandowski, Tom" <Tom.Lewandowski@discsystems.com>
To: Old Tube Radios <boatanchors@theporch.com>
Subject: Audio transformer needed
Date: Fri, 15 Oct 1999 07:22:55 -0500
MIME-Version: 1.0
Content-Type: text/plain;
 charset="iso-8859-1"

Hello

I recently acquired from my grandfathers basement, a radio chasis with most everything missing except the audio stage. He told me it was used to mix the output of a phonograph and a microphone to call square dances. Kind of an early-day karioke machine. Anyway, I thought this would be a good chassis to practice a complete rebuild of an audio stage. Not much lost if I screw up. The final output stage is a pair of 6V6's in push-pull. The transformer that couples the plates of the 6V6's to the speaker appears to have a short in the secondary. I would expect to see at least 1 ohm of dc resistance to connect to an 8 ohm speaker. I measured about 300 ohms of dc resistance across the primary with half that measured from the center tap. So, I'm looking for an audio transformer to couple the 6V6's to a speaker

with a center tap on the primary. If necessary, I have a plate transformer for trade. The secondary windings include an 800vac with center tap winding, a 6.3vac winding, and a 5vac winding. It had been used in conjunction with an 80 rectifier tube, although 800 volts seems a bit much for an 80. The dimensions are 3"x4"x2.5", and I carefully labeled all the wires. Thanks for any input.

Tom Lewandowski N9DVT

Message-ID: <9D2010848EBAD2118A9F0004ACB82C8560B86D@DISC04>
From: "Lewandowski, Tom" <Tom.Lewandowski@discsystems.com>
To: Old Tube Radios <boatanchors@theporch.com>
Subject: RE: Audio transformer needed
Date: Fri, 15 Oct 1999 09:52:19 -0500
MIME-Version: 1.0
Content-Type: text/plain;
charset="iso-8859-1"

When I measure across the secondary winding with an ohm meter, I measure the same resistance as when I have the two meter leads shorted. Maybe there is a better way to test an audio transformer.

-----Original Message-----
From: brian.harris_2@philips.com [mailto:brian.harris_2@philips.com]
Sent: Friday, October 15, 1999 9:20 AM
To: Tom.Lewandowski@discsystems.com
Subject: Re: Audio transformer needed

Tom,

The 300 Ohms you are seeing from one plate lead to the other plate lead sounds about right. The resistance from one secondary (speaker) lead to the other should be 1 Ohm or less. There should be no measureable resistance from the primary to the secondary and there should also be no measureable resistance from either the primary or the secondary to the frame of the transformer. If the transformer meets all these criteria it is likely good.

Brian

owner-boatanchors <owner-boatanchors@theporch.com> on 10/15/99 02:37:15 PM
Please respond to Tom.Lewandowski <Tom.Lewandowski@discsystems.com> @ SMTP
To: Old Tube Radios <boatanchors@theporch.com> @ SMTP

cc:

Subject: Audio transformer needed

Classification: Restricted

Hello

I recently acquired from my grandfathers basement, a radio chasis with most everything missing except the audio stage. He told me it was used to mix the output of a phonograph and a microphone to call square dances. Kind of an early-day karioke machine. Anyway, I thought this would be a good chassis to practice a complete rebuild of an audio stage. Not much lost if I screw up. The final output stage is a pair of 6V6's in push-pull. The transformer that couples the plates of the 6V6's to the speaker appears to have a short in the secondary. I would expect to see at least 1 ohm of dc resistance to connect to an 8 ohm speaker. I measured about 300 ohms of dc resistance across the primary with half that measured from the center tap. So, I'm looking for an audio transformer to couple the 6V6's to a speaker with a center tap on the primary. If necessary, I have a plate transformer for trade. The secondary windings include an 800vac with center tap winding, a 6.3vac winding, and a 5vac winding. It had been used in conjunction with an 80 rectifier tube, although 800 volts seems a bit much for an 80. The dimensions are 3"x4"x2.5", and I carefully labled all the wires. Thanks for any input.

Tom Lewandowski N9DVT

From: "Tom R. Rice" <tomrice@netcom.com>
Message-Id: <199910151658.JAA01817@netcom18.netcom.com>
Subject: rack panel data offer.....
To: Old Tube Radios <boatanchors@theporch.com>
Date: Fri, 15 Oct 1999 09:58:28 -0700 (PDT)
Cc: glowbugs@piobaire.mines.uidaho.edu (free glowbugs)
MIME-Version: 1.0
Content-Type: text/plain; charset=US-ASCII
Content-Transfer-Encoding: 7bit

Back in the days of the 19-cent hamburger, rack-mount panels were priced low enough for the average person to use them in actual projects. Today, many folks are forced to make their own, as prices have soared while the quality remains the same or has been reduced via thinner panels.

Circa 1960, the California Chassis Company, of Lynwood, CA, published a data sheet which detailed the dimensions

of panels and the standards for panel notching, both Western Electric and Amateur; yes, indeed, there were two different patterns in common use. If you're gonna build a Thirties-style rig, you'd better get it right!

As an old telephone geezer, I'm a rack-mount kinda guy, and, wishing to perpetuate this classic mode, I have made copies of this one-page document for distribution to anyone who will take the trouble to send a suitable SASE to:

Tom R. Rice
PO Box 2152
Livermore, CA 94551

73 de WB6BYH

--

"Start off every day with a smile and get it over with." --W.C.Fields

Tom R. Rice
tomrice@netcom.com

Message-ID: <001e01bf1731\$b884a3c0\$e4310d3f@kid>

From: "McGregor" <cbmchg@gte.net>

To: Old Tube Radios <boatanchors@theporch.com>

Subject: Re: Coil Winder

Date: Fri, 15 Oct 1999 10:20:57 -0700

MIME-Version: 1.0

Content-Type: text/plain;
charset="iso-8859-1"

Content-Transfer-Encoding: 7bit

Plans for a coil winding machine are available from Lindsay Publications - along with many other BA vintage radio reprints. Go to WWW.lindsaybooks.com. The coil winder book is #386 price \$8.95

73, de Chuck N7RHU

Date: Fri, 15 Oct 1999 13:49:40 -0400

From: BEN NOCK <G4BXD@compuserve.com>

Subject: Xtals wanted

To: Old Tube Radios <boatanchors@theporch.com>

Message-ID: <199910151350_MC2-892F-C2A1@compuserve.com>

MIME-Version: 1.0

Content-Transfer-Encoding: quoted-printable

Content-Type: text/plain;

charset=ISO-8859-1
Content-Disposition: inline

Xtals wanted. Any in the range =

1.750 Mhz to 1.90 Mhz

also, spot frequencies wanted:

1.7885 MHz and 1.8125 Mhz

(any holder suitable)

cheers, Ben G4BXD.

To: Old Tube Radios <boatanchors@theporch.com>
Cc: boatanchors@sco.theporch.com
Date: Fri, 15 Oct 1999 16:37:50 -0500
Subject: Fw: Mikes
Message-ID: <19991015.164608.-141111.3.jackiv@juno.com>
MIME-Version: 1.0
Content-Type: text/plain
Content-Transfer-Encoding: 7bit
From: John jack M Iverson <jackiv@juno.com>

I have a couple of the Hallicrafters microphones as used on the CB radios. Marked "hallicrafters" on the front and on the rear it says "600 ohms, made in Japan".

These are NOS without connectors. good shape.
will ship for \$13.00 each.

Jack Iverson K0EWU jackiv@juno.com
ARRL, IEEE LM, RCA, AMI, ARCI, QCWA, CCA

Message-ID: <3807AC32.2231@bellsouth.net>
Date: Fri, 15 Oct 1999 17:35:30 -0500
From: George T Folse III <kb5ww@bellsouth.net>
MIME-Version: 1.0
To: Old Tube Radios <boatanchors@theporch.com>
CC: boatanchors@listserv.tempe.gov
Subject: Re: Need Manual for Viking II and 122 VFO
Content-Type: text/plain; charset=us-ascii
Content-Transfer-Encoding: 7bit

Thanks for all the replies, I found all the manuals. Thanks for all the

help.
George

Date: Fri, 15 Oct 1999 19:08:36 -0400
From: "ROBERT W. DOWNS" <RWDDowns_WA5CAB@compuserve.com>
Subject: ZBX Mystery Solved
To: Old Tube Radios <boatanchors@theporch.com>
Message-ID: <199910151908_MC2-8929-93E9@compuserve.com>
MIME-Version: 1.0
Content-Transfer-Encoding: quoted-printable
Content-Type: text/plain;
charset=ISO-8859-1
Content-Disposition: inline

Group,

I just received an email from a collector in Australia who kept insisting=

that he wanted to buy a DY-1/ARR-2X that I have for his "ARR-2". I kept
telling him that if he had an R-4/ARR-2, he needed a DY-2/ARR-2. He
finally sent me the nameplate data from his receiver. =

"Type CW-46196 Aircraft Radio receiver =

INPUT 14 Volts =

S/N 849

A unit of Model ZBX Aircraft Radio Equipment
Manufactured for the Navy Department - Bureau of Ships
by Western Electric"

So the "X" meaning here was borrowed from the (chronologically later) AN
system. I.e., a different primary input voltage than the base set. =

Historically, the Navy aircraft sets differentiated between 14 volt and 2=
8
volt input with even and odd (or odd and even) suffix numbers.

73,
Robert Downs
WA5CAB
Houston

From: Jderm740@aol.com
Message-ID: <0.b5a22987.25390fe6@aol.com>

Date: Fri, 15 Oct 1999 19:16:54 EDT
Subject: Re: YE Antenna
To: Old Tube Radios <boatanchors@theporch.com>
MIME-Version: 1.0
Content-Type: text/plain; charset="us-ascii"
Content-Transfer-Encoding: 7bit

Hi

In all this talk about the homing systems used and could the Japanese have also used these signals to find the carriers fails to mention the CAB. These were the aircraft that circled the carriers at a high altitude to intercept any enemy aircraft. They were like gate keepers who only let the good guys (ours) through the circle.

I think history shows that aircraft carriers that we lost were lost to submarine activity rather than airpower. That is except for the Kamikaze, some of which did get through. But that was near the end of the war when desperate measures were being taken by the Japanese. Either way they were prepared to die but it meant more if they could take a lot of the enemy with them.

Jack McDermott

Message-Id: <199910160301.UAA04206@mail-gw5.pacbell.net>
From: "Arden Allen" <gumbear@pacbell.net>
To: Old Tube Radios <boatanchors@theporch.com>
Subject: Electrical Safety Handbook
Date: Fri, 15 Oct 1999 20:01:06 -0700
MIME-Version: 1.0
Content-Type: text/plain; charset=ISO-8859-1
Content-Transfer-Encoding: 8bit

This needs no explanation:

Controlling Electrical Hazards

This article provides an overview of basic electrical safety for individuals with little or limited training or familiarity with electrical hazards. The concepts and principles presented will help further an understanding of OSHA's electrical safety standards for general industry, Title 29 Code of Federal Regulations (CFR), Part 1910.302, Sub-part S-Design Safety Standards for Electrical Systems, and 1910.331 Electrical Safety-Related Work Practices Standard (1990).

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Burns and Other Injuries

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Conclusion

Introduction

This article provides an overview of basic electrical safety for individuals with little or limited training or familiarity with electrical hazards. The concepts and principles presented will help further an understanding of OSHA's electrical safety standards for general industry, Title 29 Code of Federal Regulations (CFR), Part 1910.302, Sub-part S-Design Safety Standards for Electrical Systems, and 1910.331 Electrical Safety-Related Work Practices Standard (1990).

In general, OSHA'S electrical standards are based on the National Fire Protection Associations' Standard NFPA 70E, Electrical Safety Requirements for Employee Workplaces, and in turn, from the National Electrical Code (NEC).

OSHA's electrical standards address concerns that electricity has long been recognized as a serious workplace hazard, exposing employees to such dangers as electric shock, electrocution, burns, fires, and explosions. In 1992, for example, the Bureau of Labor Statistics reported that 6,210 work-related deaths occurred in private sector workplaces employing 11 workers or more. Six percent of the fatalities, or around 347 deaths, were the direct result of electrocutions at work. What makes these statistics more tragic is that, for the most part, these fatalities could have been easily avoided.

OSHA'S electrical standards help minimize these potential hazards by specifying safety aspects in the design and use of electrical equipment and systems. The standards cover only those parts of any electrical system that an employee would normally use or contact. For example, the exposed and/or operating elements of an electrical installation-lighting, equipment, motors, machines, appliances, switches, controls, and enclosures-must be constructed and installed so as to minimize workplace electrical dangers.

For employers and employees in the 25 states operating OSHA'S approved workplace safety and health plans, their states may be enforcing standards and other procedures that while "at least effective" federal standards are not always identical to federal requirements.

How Electricity Acts?

Electricity is essential to modern life, both at home and on the job. Some employees work with electricity directly, as is the case with engineers, electricians, electronic technicians, and power line workers. Others, such as office workers and sales-people, work with it indirectly. As a source of power, electricity is accepted without much thought to the hazards encountered. Perhaps because it has become such a familiar part of our surroundings, it often is not treated with the respect it deserves.

To handle electricity safely, it is necessary to understand how it acts, how it can be directed, what hazards it presents, and how these hazards can be controlled. Operating an electric switch may be considered analogous to turning on a water faucet. Behind the faucet or switch there must be a source of water or electricity, with something to transport it, and with pressure to make it flow. In the case of water, the source is a reservoir or pumping station; the transportation is through pipes; and the force to make it flow is pressure, provided by a pump. For electricity, the source is the power generating station; current travels through electric conductors in the form of wires; and pressure, measured in volts, is provided by a generator.

Resistance to the flow of electricity is measured in ohms and varies widely. It is determined by three factors: the nature of the substance itself, the length and cross-sectional area (size) of the substance, and the temperature of the substance.

Some substances, such as metals, offer very little resistance to the flow of electric current and are called conductors. Other substances, such as bakelite, porcelain, pottery, and dry wood, offer such a high resistance that they can be used to prevent the flow of electric current and are called insulators.

Dry wood has a high resistance, but when saturated with water its resistance drops to the point where it will readily conduct electricity. The same thing is true of human skin.

When it is dry, skin has a fairly high resistance to electric current; but when it is moist, there is a radical drop in resistance. Pure water is a poor conductor, but small amounts of impurities, such as salt and acid

(both of which are contained in perspiration), make it a ready conductor. When water is present either in the environment or on the skin, anyone working with electricity should exercise even more caution than they normally would.

How Shocks Occur?

Electricity travels in closed circuits, and its normal route is through a conductor. Electric shock occurs when the body becomes a part of the electric circuit. The current must enter the body at one point and leave at another. Electric shock normally occurs in one of three ways. Individuals-while in contact with the ground- must come in contact with both wires of the electric circuit, one wire of an energized circuit and the ground, or a metallic part that has become "hot" by contact with an energized conductor.

The metal parts of electric tools and machines may become energized if there is a break in the insulation of the tool or machine wiring. The worker using these tools and machines is made less vulnerable to electric shock when there is a low-resistance path from the metallic case of the tool or machine to the ground. This is done through the use of an equipment grounding conductor- a low-resistance wire that causes the unwanted current to pass directly to the ground, thereby greatly reducing the amount of current passing through the body of the person in contact with the tool or machine. If the equipment grounding conductor has been properly installed, it has a low resistance to ground, and the worker is protected.

Severity of the Shock

The severity of the shock received when a person becomes a part of an electric circuit is affected by three primary factors: the amount of current flowing through the body (measured in amperes), the path of the current through the body, and the length of time the body is in the circuit. Other factors that may affect the severity of shock are the frequency of the current, the phase of the heart cycle when shock occurs, and the general health of the person.

The effects of electric shock depend upon the type of circuit, its voltage, resistance, current, pathway through the body, and duration of the contact. Effects can range from a barely perceptible tingle to immediate cardiac arrest. Although there are no absolute limits or even known values that show the exact injury from any given current, the table shows the general relationship between the degree of injury and amount of current for a 60-cycle hand-to-foot path of one second's duration of shock.

The table also illustrates that a difference of less than 100 milliamperes exists between a current that is barely perceptible and one that can kill. Muscular contraction caused by stimulation may not allow the victim to free himself or herself from the circuit, and the increased duration of exposure increases the dangers to the shock victim. For example, a current of 100 milliamperes for 3 seconds is equivalent to a current of 900 milliamperes applied for .03 seconds in causing ventricular fibrillation. The so-called low voltages can be extremely dangerous because, all other factors being equal, the degree of injury is proportional to the length of time the body is in the circuit. LOW VOLTAGE DOES NOT IMPLY LOW HAZARD!

A severe shock can cause considerably more damage to the body than is visible. For example, a person may suffer internal hemorrhages and destruction of tissues, nerves, and muscles. In addition, shock is often only the beginning in a chain of events. The final injury may well be from a fall, cuts, burns, or broken bones.

Effects of Electric Current in the Human Body

Current	Reaction
1 Milliampere	Perception level. Just a faint tingle.
5 Milliamperes	Slight shock felt; not painful but disturbing.

Average individual can let go. However, strong involuntary reactions to shocks in this range can lead to injuries.	6-25 Milliamperes (women)
Painful shock, muscular control is lost.	9-30 Milliamperes (men)
This is called the freezing current or "let-go" range.	50-150 Milliamperes
Extreme pain, respiratory arrest, severe muscular contractions.*	
Individual cannot let go. Death is possible.	1,000-4,300 Milliamperes
Ventricular fibrillation. (The rhythmic pumping action of the heart ceases.) Muscular contraction and nerve damage occur. Death is most likely.	10,000-Milliamperes
Cardiac arrest, severe burns and probable death.	

*If the extensor muscles are excited by the electric shock, the person may be thrown away from the circuit.

Source: W.B. Kouwenhoven, "Human Safety and Electric Shock," Electrical Safety Practices, Monograph, 112, Instrument Society of America, p. 93. (Papers delivered at the third presentation of the Electrical Safety Course given in Wilmington, DE, in November 1968.)

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Burns and Other Injuries

The most common shock-related injury is a burn. burns suffered in electrical accidents may be of three types: electrical burns, arc burns, and thermal contact burns.

Electrical burns are the result of the electric current flowing through tissues or bone. Tissue damage is caused by the heat generated by the current flow through the body. Electrical burns are one of the most serious injuries you can receive and should be given immediate attention.

Arc or flash burns, on the other hand, are the result of high temperatures near the body and are produced by an electric arc or explosion. They should also be attended to promptly.

Finally, thermal contact burns are those normally experienced when the skin comes in contact with hot surfaces of overheated electric conductors, conduits, or other energized equipment. Additionally, clothing may be ignited in an electrical accident and a thermal burn will result. All three types of burns may be produced simultaneously.

Electric shock can also cause injuries of an indirect or secondary nature in which involuntary muscle reaction from the electric shock can cause bruises, bone fractures, and even death resulting from collisions or falls. In some cases, injuries caused by electric shock can be a contributory cause of delayed fatalities.

In addition to shock and burn hazards, electricity poses other dangers. For example, when a short circuit occurs, hazards are created from the resulting arcs. If high current is involved, these arcs can cause injury or start a fire. Extremely high-energy arcs can damage equipment, causing fragmented metal to fly in all directions. Even low-energy arcs can cause violent explosions in atmospheres that contain flammable gases, vapors, or combustible dusts.

Preventing Electrical Hazards

Electrical accidents appear to be caused by a combination of three possible factors- unsafe equipment and/or installation, workplaces made unsafe by the environment, and unsafe work practices. There are various ways of protecting people from the hazards caused by electricity. These include: insulation, guarding, grounding, electrical protective devices, and safe work practices.

Insulation

One way to safeguard individuals from electrically energized wires and parts is through insulation. An insulator is any material with high

resistance to electric current.

Insulators-such as glass, mica, rubber, and plastic-are put on conductors to prevent shock, fires, and short circuits. Before employees prepare to work with electric equipment, it is always a good idea for them to check the insulation before making a connection to a power source to be sure there are no exposed wires. The insulation of flexible cords, such as extension cords, is particularly vulnerable to damage.

The insulation that covers conductors is regulated by Subpart S of 29 Code of Federal Regulations (CFR) Part 1910.302, Design Safety Standards for Electrical Systems, as published in the Federal Register on January 16, 1981.

Subpart S generally requires that circuit conductors (the material through which current flows) be insulated to prevent people from coming into accidental contact with the current. Also, the insulation should be suitable for the voltage and existing conditions, such as temperature, moisture, oil, gasoline, or corrosive fumes. All these factors must be evaluated before the proper choice of insulation can be made.

Conductors and cables are marked by the manufacturer to show the maximum voltage and American Wire Gage size, the type letter of the insulation, and the manufacturer's name or trademark. Insulation is often color coded. In general, insulated wires used as equipment grounding conductors are either continuous green or green with yellow stripes. The grounded conductors that complete a circuit are generally covered with continuous white or natural gray-colored insulation. The ungrounded conductors, or "hot wires," may be any color other than green, white, or gray. They are often colored black or red.

Guarding

Live parts of electric equipment operating at 50 volts or more must be guarded against accidental contact. Guarding of live parts may be accomplished by:

- enclosure in a room, vault, or similar enclosure accessible only to qualified persons;

- use of permanent, substantial partitions or screens to exclude unqualified persons;

- enclosure on a suitable balcony, gallery, or platform elevated and arranged to exclude unqualified persons; or

ielevation of 8 feet (2.44 meters) or more above the floor.

Entrances to rooms and other guarded locations containing exposed live parts must be marked with conspicuous warning signs forbidding unqualified persons to enter.

Indoor electric wiring more than 600 volts and that is open to unqualified persons must be made with metal-enclosed equipment or enclosed in a vault or area controlled by a lock. In addition, equipment must be marked with appropriate caution signs.

Grounding

Grounding is another method of protecting employees from electric shock; however, it is normally a secondary protective measure. The "ground" refers to a conductive body, usually the earth, and means a conductive connection, whether intentional or accidental, by which an electric circuit or equipment is connected to earth or the ground plane. By "grounding" a tool or electrical system, a low-resistance path to the earth is intentionally created. When properly done, this path offers sufficiently low resistance and has sufficient current carrying capacity to prevent the buildup of voltages that may result in a personnel hazard. This does not guarantee that no one will receive a shock, be injured, or be killed. It will, however, substantially reduce the possibility of such accidents - especially when used in combination with other safety measures discussed in this booklet.

There are two kinds of grounds required by Design Safety Standards for Electrical Systems (Subpart S). One of these is called the "service or system ground." In this instance, one wire-called "the neutral conductor" or "grounded conductor" - is grounded. In an ordinary low-voltage circuit, the white (or gray) wire is grounded at the generator or transformer and again at the service entrance of the building. This type of ground is primarily designed to protect machines, tools, and insulation against damage.

To offer enhanced protection to the workers themselves, an additional ground, called the "equipment ground," must be furnished by providing another path from the tool or machine through which the current can flow to the ground. This additional ground safeguards the electric equipment operator in the event that a malfunction causes the metal frame of the tool to become accidentally energized. The resulting heavy surge of current will then activate the circuit protection devices and open the circuit.

Circuit Protection Devices

Circuit protection devices are designed to automatically limit or shut off the flow of electricity in the event of a ground-fault, overload, or short circuit in the wiring system. Fuses, circuit breakers, and ground-fault circuit interrupters are three well-known examples of such devices.

Fuses and circuit-breakers are over-current devices that are placed in circuits to monitor the amount of current that the circuit will carry. They automatically open or break the circuit when the amount of current flow becomes excessive and therefore unsafe. Fuses are designed to melt when too much current flows through them. Circuit breakers, on the other hand, are designed to trip open the circuit by electro-mechanical means.

Fuses and circuit breakers are intended primarily for the protection of conductors and equipment. They prevent over-heating of wires and components that might otherwise create hazards for operators. They also open the circuit under certain hazardous ground-fault conditions.

The ground-fault circuit interrupter, or GFCI, is designed to shutoff electric power within as little as 1/40 of a second. It works by comparing the amount of current going to electric equipment against the amount of current returning from the equipment along the circuit conductors. If the current difference exceeds 6 milliamperes, the GFCI interrupts the current quickly enough to prevent electrocution. The GFCI is used in high-risk areas such as wet locations and construction sites.

Safe Work Practices

Employees and others working with electric equipment need to use safe work practices. These include: deenergizing electric equipment before inspecting or making repairs, using electric tools that are in good repair, using good judgment when working near energized lines, and using appropriate protective equipment. Electrical safety-related work practice requirements are contained in Subpart S of 29 CFR Part 1910, in Sections 1910.331-1910.335.

Training

To ensure that they use safe work practices, employees must be aware of the electrical hazards to which they will be exposed. Employees must be trained in safety-related work practices as well as any other procedures necessary for safety from electrical hazards.

Deenergizing Electrical Equipment. The accidental or unexpected sudden starting of electrical equipment can cause severe injury or death. Before ANY inspections or repairs are made -- even on the so-called low-voltage circuits-the current must be turned off at the switch box and the switch

padlocked in the OFF position. At the same time, the switch or controls of the machine or other equipment being locked out of service must be securely tagged to show which equipment or circuits are being worked on.

Maintenance employees should be qualified electricians who have been well instructed in lockout procedures. No two locks should be alike; each key should fit only one lock, and only one key should be issued to each maintenance employee. If more than one employee is repairing a piece of equipment, each should lock out the switch with his or her own lock and never permit anyone else to remove it. The maintenance worker should at all times be certain that he or she is not exposing other employees to danger.

Overhead Lines

If work is to be performed near overhead power lines, the lines must be deenergized and grounded by the owner or operator of the lines, or other protective measures must be provided before work is started. Protective measures (such as guarding or insulating the lines) must be designed to prevent employees from contacting the lines.

Unqualified employees and mechanical equipment must stay at least 10 feet (3.05 meters) away from overhead power lines. If the voltage is more than 50,000 volts, the clearance must be increased by 4 inches (10 centimeters) for each additional 10,000 volts.

When mechanical equipment is being operated near over-head lines, employees standing on the ground may not contact the equipment unless it is located so that the required clearance cannot be violated even at the maximum reach of the equipment.

Protective Equipment. Employees whose occupations require them to work directly with electricity must use the personal protective equipment required for the jobs they perform. This equipment may consist of rubber insulating gloves, hoods, sleeves, matting, blankets, line hose, and industrial protective helmets.

Tools. To maximize his or her own safety, an employee should always use tools that work properly. Tools must be inspected before use, and those found questionable, removed from service and properly tagged. Tools and other equipment should be regularly maintained. Inadequate maintenance can cause equipment to deteriorate, resulting in an unsafe condition.

Tools that are used by employees to handle energized conductors must be designed and constructed to withstand the voltages and stresses to which they are exposed.

Good Judgment. Perhaps the single most successful defense against electrical accidents is the continuous exercising of good judgment or

common sense. All employees should be thoroughly familiar with the safety procedures for their particular jobs. When work is performed on electrical equipment, for example, some basic procedures are:

1. Have the equipment deenergized. 2. Ensure that the equipment remains deenergized by using some type of lockout and tag procedure. 3. Use insulating protective equipment. 4. Keep a safe distance from energized parts.

Conclusion

The control of electrical hazards is an important part of every safety and health program. The measures suggested in this article should be of help in establishing such a program of control. The responsibility for this program should be delegated to individuals who have a complete knowledge of electricity, electrical work practices, and the appropriate OSHA standards for installation and performance.

Everyone has the right to work in a safe environment. Through cooperative efforts, employers and employees can learn to identify and eliminate or control electrical hazards.

Footnote(1) †OSHA'S Construction Standards, 29 CFR 1926, Subpart K-equivalent to those in Subpart S but contain fewer safety-related work practices-comprise electrical safety requirements. OSHA'S Maritime Standards, 29 CFR Parts 1915, 1917, 1918, and 1919 contain fewer electrical requirements.

Footnote(2) †Fatal Workplace Injuries in 1995: A Collection of Data and Analysis, Table A- 15. Bureau of Labor Statistics Report 913. U.S. Department of Labor, Washington, DC.

Footnote(3) †Section 18(b), P.L. 95-596, encourages states to develop and operate under OSHA guidance, job safety and health plans. An OSHA-approved state plan must have safety and health requirements at least as effective as those of Federal OSHA and must adopt, within 6 months of promulgation of federal standards, comparable state standards.

This informational article is intended to provide a generic, non-exhaustive

overview of a particular standards-related topic. This publication does not itself alter or determine compliance responsibilities, which are set forth in OSHA standards themselves and the Occupational Safety and Health Act. Moreover, because interpretations and enforcement policy may change over time, for additional guidance on OSHA compliance requirements, the reader should consult current administrative interpretations and decisions by the Occupational Safety and Health Review Commission and the courts.

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